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ABSTRACT

A program description and evaluation for a high school course in aviology is presented. The curriculum, originally taught at the Laboratory School at the University of Florida, was designed to: (1) use aviation as a motivator for science; (2) present an overview of aviation; (3) help students see their role in the future of aviation; (4) provide an opportunity to fly a light aircraft; (5) make students aware of aviation career opportunities; and (6) allow students to take the Federal Aviation Administration (FAA) Private Pilot Written Examination. Part I discusses the five schools involved in this program, program goals and extent to which they were met, and the original and revised curriculum outlines. Part II summarizes the evaluation based upon four instruments: Any School Subject Attitude Test, the FAA Private Pilot Written Exam or the Sanderson Final Exam for the Sanderson Aviation Fundamentals Course, a student questionnaire, and a state high school student survey. Results indicate that students' attitudes were generally positive. Scores on the FAA and Sanderson exams were mixed, reflecting differences in teaching styles and course emphasis. Students thought aviation was worthwhile, and that flying was fun, exciting, and important. They wanted more flying, field trips, films, and time using the simulator. (DC)

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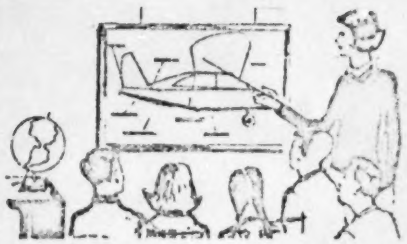

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AVIOLOGY:

A Report of a Research Study

in Aviation Science

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RESEARCH MONOGRAPH NUMBER 29

P. K. Yonge Laboratory School

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AVIOLOGY:

A Report of a Research Study

in Aviation Science

by

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and

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CONTENTS

	Page
PART I: AVIOLOGY CURRICULUM	1
Description of the Aviology Project	1
Project Goals and Achievements	2
Assessment of the Curriculum Outline	3
PART II: EVALUATION	14
Discussion of Evaluation Procedures	14
Results	14
Conclusions	20
APPENDIXES	
Appendix I: Attitude Test	22
Appendix II: Aviology Student Questionnaire	24
Appendix III: Aviology Survey Questionnaire	26
ADDENDAE	
Course Description	27
Summary of Results	27

This study was conducted during the period beginning August 29, 1972, and ending June 30, 1973, by P. A. Becht and T. Gadsden, Jr.

PART I AVIOLOGY

1. Description of the Aviology Project:

The Aviology Curriculum developed by Paul Becht and Thomas Gadsden, Jr., at P. K. Yonge Laboratory School, University of Florida, Gainesville, Florida is an interdisciplinary science course using aviation to motivate students in science. The program is an outcome of a course taught for two years at the Laboratory School and redesigned to be used in the public school system. It is designed to be low cost and highly motivating.

This study involves five schools in the state of Florida:

a) Raines High School, Jacksonville, Florida - Raines High School is a high school located in a predominately black suburban region of Jacksonville, The school is a fairly modern brick school with central air-conditioning. The student population is around 2000. There are a few white and Cuban-American students enrolled at the school. The Aviology Class started with 19 students from grades 9 and 12. Thirty per cent of the class were girls. All of the students, except for one, were black. The instructor for the program was John Ten Broeck, who also is a private pilot.

b) Newberry High School, Newberry, Florida - Newberry High School is located in a rural area devoted to farming and ranching about 15 miles west of Gainesville, Florida. The school is new with central air-conditioning and modern facilities with a student population around 750. Most of the student population comes from rural black and white homes. The Aviology Class started with 30 students from grades 9 and 12. Fifty per cent of the class were girls. About half of the class were black. The instructor for the program was Al Losch, a non-pilot.

c) Bunnell High School, Bunnell, Florida - Bunnell High School is located in a rural area about 20 miles north of Daytona Beach, Florida. The area is primarily agricultural. The school is new (built this past year) and has both modern facilities and air-conditioning. The student population is around 600. The Aviology Class at Bunnell High School was different from the other Aviology Classes in the respect that it was a Physics Class in both title and content, but used the Aviology materials as supplemental materials. The Aviology Class started with 18 students from grades 11 and 12. Mostly all of the students were boys from rural areas. The instructor for the program was Mary Gurnee, who also is a pilot.

d) Gainesville High School, Gainesville, Florida - Gainesville High School is located in Gainesville, Florida. The school has a modern plant but is not new. The student population is around 2000 and the students come from all areas of the city. The Aviology Class started with 27 students from grades 9 through 12. All of the students were boys, mostly white. The instructor for the program was Jay Cooper, who also is a private pilot.

e) P. K. Yonge Laboratory School, Gainesville, Florida - P. K. Yonge is the Laboratory School for the College of Education, University of Florida. It is a K through 12 grade school with a population of about 1000 students selected from Alachua County using a formula consistent with the normalized school population for the state of Florida. The school plant is modern but not new. The Aviology Class started with 17 students from grades 9 through 12. Ninety-five per cent of the class were boys. Eighty-five per cent of the students were white. The instructors for the program were Paul Becht, a private pilot, and Tom Gadsden Jr., a non-pilot.

2. Project Goals and Achievements:

The curriculum goals for the project were as follows:

a) To excite the student in science using aviation as a motivator.

b) To present aviation as it is - good and bad - and to discuss aviation technology and safety.

c) To make the student aware of his possible role in the future of aviation.

d) To give the student an opportunity to fly a light aircraft.

e) To acquaint students with career opportunities within aviation.

f) To take the student through the FAA Private Pilot Written Examination.

Each of the curriculum goals listed were achieved to some degree during the term of the project.

a) The students were excited by the simulator and the different experiences with aviation. Both the simulator log book and the observations by the instructors indicate a high interest in the simulator during all the time it was in the schools. Opportunities to fly in a light aircraft caused much excitement even though only half of the student population took up the invitation to fly. Teachers indicated that both the student activities and the films were also a cause for much excitement. The data in Part II of this report also indicates a high level of excitement with the program.

b) All sides of the world of aviation were presented to the student through the use of value sheets, field trips and guest speakers.

c) An attempt was made to prepare the students to cope with the possible necessity to travel by air as well as realize the impact aviation will have on them in the future. Both the study of the science of aviation and the involvement of students in the aviation oriented science activities helped many students overcome the fears of aviation. This is also indicated in Part II of this report under the discussion of the student questionnaire.

d) All students had the opportunity to fly in a light aircraft with an instructor. About half the students took advantage of the offer to fly; however, it was not a required activity. Many of the students who did not fly could not obtain their parents permission or were frightened with flying.

e) Career opportunities were presented to students in three ways: i) through field trips, ii) readings, and iii) guest speakers. Also the value sheets (in the student and teacher materials of this report) helped to orientate the students toward aviation career opportunities.

f) All students did not take the FAA Private Pilot Exam. We found that a new ruling exists, effective November 1, 1973, which states that no person under 15 years of age can take the exam. This ruling was effective as a policy by the local GADO people. We were able to obtain a waiver of this policy for our students. Additional discussion of this goal is included in Part II of this report.

One of the unwritten goals of the Aviology Program was to survey the state of Florida to determine school interest in an Aviology type program. This survey (Appendix II, Part II) was sent to every high school in the state. At this writing approximately one-fifth of the data has been tabulated; 133 classes, 3700 students. This sample indicated 46% of the students questioned would like to take a course like Aviology, 27% have considered aviation as a career and 45% have flown in a commercial aircraft. Also only 7.5% of the schools polled had an aviation curriculum in their schools.

3. Assessment of the Curriculum Outline:

The participating teachers (Al Losch, Jay Cooper, John Ten Broeck, and Mary Gurnee) and the project directors (Paul Becht and Tom Gadsden) express their feelings and opinions concerning the degree of success and the need for revision about each part of the Aviology curriculum. Also, the program itself underwent revisions during the year as areas in need of improvement were identified.

Both the revisions already made and the comments of the participating teachers and directors are reported below.

ORIGINAL OUTLINE

I. History and Principles of Flight and Aviation

A. Flight - The Dream of the Ancients

1. Icarus - to -
2. Leonardo da Vinci

B. How Many Ways Can You Fly?

1. Japanese - Kites
2. Chinese - Rockets
3. French - Balloons
4. Newton and the Laws of Motion

C. The Wright Brothers and the Air Foil

1. Kitty Hawk - The Air Foil
2. Model Airplanes and the center of gravity. Dirigible ---- Blimp ---- Glider ---- V/STOL

REVISED OUTLINE

I. History and Principles of Flight and Aviation

A. Flight - The Dream of the Ancients

1. Modern Aviation/Aerospace
2. The Ancients - Their Dreams
3. Modern Dreams - Leonardo da Vinci, Wrights, etc.

B. How Many Ways Can You Fly?

1. Chinese - Kites
2. Chinese - Rockets
3. French - Balloons
4. Italians - Gliders
5. Jules Verne and accomplices

C. Newton and/or Bernoulli

1. Issac Newton and the Foundations of Flight
2. Did Bernoulli Give Us A Lift?

Comments

This section kept students very busy and appeared successful in motivating them. It served as a suitable introduction and showed students that Aviology could be a lot of fun. Activities included: introduction to the simulator, individual projects building something that flies, laboratory experience, readings, films, and questions and problems. More laboratory experiences are needed in C. Newton and/or Bernoulli.

ORIGINAL OUTLINE

D. Aircraft Power Plants or How do You Make It Go?

1. Peddle Power
2. Steam Power
3. Internal Combustion Engine
4. Rotary Engine
5. Turbojet Engine
6. Jet Power
7. Rocket Power

REVISED OUTLINE

Did Not Use

Comments

There were many difficulties in identifying materials suitable for high school use. Students did not seem anxious to pursue this topic. Not essential to this part of the program, but could be used in reference to vocational training and could be a good point to make a tie between academic and vocational education.

ORIGINAL OUTLINE

E. What is a Plane Made of and Look Like:

1. Wright Brothers Special
2. WWI - Sopwith Camel - Red Baron
3. Piper Cubs
4. P-51, B-25, Ford Tri-Motor
5. Boeing 707, 747, Convair 880
6. Gemini
7. Apollo
8. Yankee Trainer, Cessna 150

REVISED OUTLINE

Only brief coverage. Topics considered in other parts of the course.

Comments

This topic is not essential to the program, but could be a nice starting point for an independent study later in the course. Taught this time using posters and very brief discussions.

II. Operation of Aircraft

A. The Physical Plant

1. External Operational Parts
   a. ailerons
   b. rudder
   c. trim tab
   d. elevator
   e. propellor

II. Operation of Aircraft

Followed Original Outline

II. (cont.)

A.

2. Internal Operational Parts (Controls)

Followed Original Outli

a. stick
b. rudder pedals
c. trim tab controls
d. throttle

3. Instruments

a. Pressure System
b. Gyro System
c. Tachometer
d. Clock

Followed Original Outli

Comments

Sections 1 and 2 were okay. The use of a lot of audiovisual aides, a field trip to examine a real airplane, and use of the ATC simulator made these sections highly motivating. Section 3 concerning instruments was too difficult. Some students began to get lost and consequent lose interest. This section must be improved. In all three sections much more basic physics should be intermeshed with the instructional topics. There are many opportunities to teach some physics here to help students better understand the operating parts of the aircraft. They should be more fully utilized.

ORIGINAL OUTLINE	REVISED OUTLINE
4. Fuel Management	4. Fuel Management
5. Weight and Balance	5. Weight and Balance a. What's Weight b. Balancing Torque c. What it Means to an Airplane
6. Engine Operation	6. Engine Operation a. Power Plants b. Safety Factors
7. Aircraft Certification Requirements	7. Aircraft Certificati Requirements

Comments

Sections 4, 5, and 6 need much expansion, especially into the basic scientific explanations of why these things happen. This could be a very worthwhile section but needs work. There need to be fewer lectures and discussions and more "hands on" activities in this part. Section 7 was treated only briefly here in a one or two day discussion of FAR's and safety. Safety, however, is stressed throughout the course in every place that it is appropriate.

ORIGINAL OUTLINE

B. The Pilot

1. Pilot Physical Requirements
2. Flying diseases

   a. vertigo
   b. hypoxia
   c. air sickness
   d. bends
   e. vision problems
   f. G-forces (acceleration) (Attributed Sickness)
   g. noise and low frequency vibrations (Attributed Sickness)
   h. reverse sensing of instruments
   i. disorientation
   j. hypnosis

3. Flight Emergencies

   a. engine failure
   b. fire
   c. icing
   d. turbulence
   e. what to do if lost

REVISED OUTLINE

Followed Original Outline

Comments

This is a good section but could be substantially improved. Role playing techniques may be of use here in sections 2 and 3.

III. Navigation

A. Charts

1. Types of Charts
2. Understanding Chart Symbols
3. Use of Plotter and Course Plotting

Followed Original Outline

Comments

This is an excellent point to bring in some more concepts from the earth sciences and cartography. Students handled the material well and seemed to enjoy beginning to use the charts.

ORIGINAL OUTLINE

B. Navigational Methods

1. Dead Reckoning

a. Use of compass

b. Use of Charts & Maps

2. Use of Navigational Computer

a. Wind Triangle
b. Computation of Time, Fuel, & Distance

3. Instrument Navigation

4. Celestial Navigation

5. Navigating Around the Weather

REVISED OUTLINE

B. Navigational Methods

1. Dead Reckoning

a. Use of Magnetic Compass
(1) Magnetic Fields
(2) Deviation and Declination
b. Use of Gyro Compass
(1) Gyroscopes
(2) Precession
c. Use of Charts & Maps

2. Use of Navigational Computer

a. Vectors & Flying
b. Wind Triangle
c. Time, Fuel, & Distance

3. Instrument Navigation

a. OMNI
b. Area Navigation
(1) Inertial Guidance System
(2) Course Line Computer
c. ADF

4. Navigating Around the Weather
a. Weather Radar
b. Flight Service Station

Comments

In general this part was successful. Section 1 was expanded substantially to bring in more explanation of how compasses operate and why aircraft use both magnetic and gyro compasses. Many students were confused by this section. These ideas need to be treated more creatively and with more student involvement and hands-on activities. Further expansion may also improve understanding of this section. Section 2 was centered on course plotting but the addition of some activities with vectors improved understanding. Students seemed to enjoy using the plotter and computer. Section 3 was expanded with filming, field trips, and discussions of modern

radio navigation techniques and radio theory. Again, more hands-on activities would improve understanding. Celestial Navigation should be an optional section for those especially interested in it. Section 4 was a good lead into Meteorology.

However, throughout the unit on Navigation, advantage should be taken of the many opportunities to explore Navigation related careers (e.g., navigating, map and chart making, surveying, instrument design and construction, air radio electronics, etc.).

ORIGINAL OUTLINE	REVISED OUTLINE
IV. Meteorology	IV. Meteorology
A. Nature of the Atmosphere	A. The Atmosphere & Movement of Air above the Surface 1. Coriolis Effect 2. Convection 3. Jet Stream
B. Pressure Cells a. Frontal Movements b. Storms	B. Pressure Cells 1. High Pressure 2. Low Pressure
C. Moisture and Temperature	C. Charles' and Boyles' Laws 1. Chinouk Winds 2. Normal Lapse Rate 3. Convection Cooling 4. P 1/v and P T
D. Effects of the Weather on the Aircraft	D. Frontal Movements 1. Cold Fronts 2. Warm Fronts 3. Stationary Fronts 4. Occluded Fronts
	E. The Fluffy Cloud 1. Relative Humidity 2. Dew Point 3. Types of Clouds 4. Clouds Associated with Fronts 5. Atmospheric Conditions Within Clouds

ORIGINAL OUTLINE

REVISED OUTLINE

F. Weather Maps

1. Newspaper Maps
2. Surface Weather Chart
3. Weather Depiction Chart
4. Radar Summary Chart
5. Low-Level Prognosis Chart
6. Satellite Charts

G. Weather Reports

1. Sequence Reports
2. Winds Aloft Forecast
3. Terminal Forecasts
4. Area Forecasts
5. Severe Weather Forecasts
6. Sigmets, Airmets, and Perepts

Comments

The expanded version of Meteorology worked well. It lasted about 9 weeks. The physics of weather should be treated more in this unit and many opportunities exist to look at Aviation-Meteorology related careers.

ORIGINAL OUTLINE

REVISED OUTLINE

V. Operation of Airports

A. Airport Layout

1. Runways
2. Ground Transportation
3. Location of Airports

a. Ecology
b. Safety
c. Usefulness

Followed Original Outline

B. Communications

1. Light
2. Radio
3. Wind Triangle & Wind Sock

C. Air Traffic Control

1. Towers
2. Rules and Regulations

D. Fixed Base Operators

E. Aircraft Terminal — Followed Original Outline

F. Take Off and Landing Procedures and Equipment

Comments

These sections were heavily oriented toward transportation careers, but also stressed decision making concerning air transportation and the relationship between the aircraft and the airport. Sections C, D, E, F, were treated very briefly, primarily through field trips and visiting speakers. The radio communications portion sparked more interest than expected and may need expansion.

ORIGINAL OUTLINE — REVISED OUTLINE

VI. Commercial Aviation

A. Aviation Industries

1. Aircraft Manufacturer
2. Aviation Electronic Industry
3. Travel Agencies

Followed Original Outline

B. Commercial Aircraft and Equipment

C. Airspace

1. Air Routes - National & International
2. International Aviation Rules

D. Commercial Aviation Personnel & Job Opportunities

E. Passenger Service

1. From the View of the Airline

a. In the terminal
b. In the aircraft

2. From the view of the Passenger

a. In the terminal
b. In the aircraft

F. Transportation Alternatives -- Pros and Cons

1. Railways
2. Automobile
3. Boats
4. Other

Followed Original Outline

Comments - Sections A, B, C

Too little was done with these sections. Field trips and guest speakers were the primary activities. Field trips must be optional depending on the availability of resources.

Comments - Sections D, E, F

These sections were far too brief. The use of value sheets to explore value clarification with respect to air transportation seems promising, but teachers will need help using this technique. Field trips and visitors were good. Many careers were investigated but more should be included.

This unit (VI - Commercial Aviation) needs extensive work. It might be more effective and meaningful if it was taught early in the year rather than at the end. It might be retitled, The System of Air Transportation to include private, industrial, and governmental use of flight for transportation as well as the commercial airlines. A teacher who feels confident with the idea of systems (or who is willing to prepare himself) could approach the unit by introducing the idea of a system, studying air transportation as a system, and then comparing the air transportation system with other systems of transportation (rail, water, highway, etc.). This approach needs development.

ORIGINAL OUTLINE

VII. Future of Aviation

A. Private Pilot

1. Personal View
2. Professional View

B. Commercial Pilot

1. Personal View
2. Professional View

C. Current Aircraft

1. Size
2. Speed
3. Environmental Problems.

REVISED OUTLINE

Followed Original Outline

ORIGINAL OUTLINE

D. Effects of Air Transportation on Individuals

1. Daily Life
2. Philosophy
3. Time Zone Adjustments

E. Effects of Air Transportation on the World's Cultures

F. Future Aircraft

1. Experimental Craft

a. Gyrocopters
b. Push-prop
c. High Speed Craft
d. V/STOL
e. Rocket Planes
f. Gliders

G. Future Problems

1. Congestion
2. Pollution

H. Space Travel

REVISED OUTLINE

Followed Original Outline

Comments

This unit is packed with potentially stimulating topics. However, to deal with them in a cursory manner may not be stimulating. Students, this year, seemed to view this unit as anticlimactic and a let down. Some parts were highly successful, but overall a different approach may be more effective. Visiting speakers, projects, value sheets, discussions and some films were used.

Alternatives that might be considered would include:

(1) Using portions of this unit but not the entire unit at other times during the year to amplify an idea and to motivate students.
(2) Encourage students to take one portion of the unit and do an extended project on that topic.

PART II EVALUATION

1. Discussion of Evaluation Procedures:

Evaluation for the Aviology Program was carried out during May 1973 using the following four evaluations:

a) Any School Subject Attitude Test - This test is used to determine the attitude of students toward Aviology. Silance and Remmers report equivalent - forms reliabilities ranging from 0.81 to 0.90 using both high school and college students and using different school subjects as attitudinal references. This scale has been validated using criterion groups measured for interest and values.

b) FAA Private Pilot Written Exam - Sanderson Exam was substituted in lieu of the FAA Exam because of difficulties obtaining FAA Exams for some students.

c) Student Questionnaire - This questionnaire was designed by the researcher. It is designed to obtain formative data from the students as to their feelings about the program and how improvements might be made. This questionnaire will be used for formative data only.

d) State High School Student Survey - This survey will consist of a simple questionnaire sent to all high schools in the state of Florida asking the science teachers to ask the juniors and seniors taking science courses if they would like to take a course in Aviology if it would be offered in their school. The teacher will have a copy of the program outline to read to the students. The teacher will record the number of favorable responses and the number of students in the class and return the questionnaire to the researchers. The replies will be tallied and used to indicate state need of a program like Aviology.

2. Results:

The results of these evaluations are of interest in many ways not envisioned by the researchers. One school is not represented by evaluation data because no students showed for the evaluations. Following is a list of results for each of the evaluations except the State High School Survey. The survey is held up in the computer and will hopefully be completed during the next two weeks. The total report of the State High School Survey will be sent to you as soon as all the statistics and the total data have been analyzed. A copy of the survey is found in Appendix III.

a) Any School Subject Attitude Test--The test is divided into 45 questions, half of which indicate positive feelings and the other half negative. A score of 45 indicated all positive responses; a score of 90 indicated all negative responses. A score of 67 was the mean for this evaluation. A score below 67 was taken to indicate a positive attitude, above 67 a negative attitude. Since there were no control classes for this evaluation, the results of this evaluation can only be generalized to the schools and classes involved in the study.

i) Newberry High School - mean score = 62.4 for 21 students taking the evaluation.

ii) Bunnell High School - mean score = 61.4 for 11 students taking the evaluation.

iii) P. K. Yonge Laboratory School - mean score of 57.5 for 13 students taking the evaluation.

iv) Gainesville High School - mean of 63.0 for 21 students taking the evaluation.

The average score for the four schools is 61.08 for 66 students.

b) Private Pilot Written Exam - The exam given was the Sanderson Final Exam for the Sanderson Aviation Fundamentals Course. Only two schools completed this exam and two schools took the FAA Private Pilot Written Exam.

i) Newberry High School - The exam was not given. The instructor felt the exam would defeat many students so different types of evaluation were designed by the teacher to evaluate his students.

ii) Bunnell High School - Sanderson Form A mean score out of 100 points = 36.7 for 9 students taking the exam.

iii) P.K. Yonge Laboratory School - Sanderson Forms A and B mean score out of 100 points = 43.6 for 16 students taking the exam. Fifteen students took the FAA Private Pilot Written exam and 4 out of 7 students who received results before leaving school passed the exam. Both exams were taken within a week.

c) Student Questionnaire - The student questionnaire was designed in two parts; the first part of seven questions was a forced choice Q-sort test; the second part, a four question short-answer evaluation. Following is a tally of each question of part one with respect to each school.

c) The following code will be used:
Newberry H.S. - NHS
Bunnell H.S. - BHS
P.K. Yonge Lab - PKY
Gainesville H.S. - GHS

i) Aviology is really exciting.

school	yes	maybe	no
NHS	9	12	1
BHS	8	1	0
PKY	12	1	1
GHS	10	6	5
TOTAL	39	20	7

ii) Aviology is fun.

school	yes	maybe	no
NHS	13	9	0
BHS	8	1	0
PKY	13	1	0
GHS	13	3	6
TOTAL	47	14	6

iii) I learned a lot of science in Aviology.

school	yes	maybe	no
NHS	17	4	1
BHS	2	3	4
PKY	11	2	1
GHS	12	3	6
TOTAL	42	12	12

iv) I learned how aviation could affect my life.

school	yes	maybe	no
NHS	15	5	1
BHS	4	2	2
PKY	14	0	0
GHS	11	4	6
TOTAL	44	11	9

v) Now I can explain to my best friend why an airplane flys.

school	yes	maybe	no
NHS	10	9	3
BHS	2	4	3
PKY	12	0	2
GHS	13	7	1
TOTAL	37	20	9

c) vi) The simulator turned me on!

school	yes	maybe	no
NHS	8	10	4
BHS	2	3	4
PKY	2	10	2
GHS	5	9	6
TOTAL	17	32	16

vii) Now I know what it takes to pilot and navigate an airplane.

school	yes	maybe	no
NHS	12	9	2
BHS	5	3	1
PKY	13	1	0
GHS	14	5	2
TOTAL	44	18	5

Due to the magitude of the data in part two, a summary of the responses from each school will be presented for each question with a general summary following.

i) Now that you have taken Aviology, what do you think about flying?

NHS: fun; great; good subject; exciting; not all fun; nice
Comments:
I think flying is fun when you understand how a plane works.
I think it is great although it is not all fun and flying around, you also have to plot your courses, find out area weather, and use your computer to find time, distance and fuel rate.
I think flying is fun if you are not scare (sic) of flying.
I think it will be fun for those who want to fly, but I don't.

BHS: interesting; like more; understand better; going into Air Force
Comments:
I understand it better and I like it more.

PKY: fun; want a license to fly; interesting; great challenge; everyone should know more; good way to make living; all right
Comments:
Flying was fun, but I don't think I would really like to fly as it scares me and I don't trust my judgement.
I remain enthusiastic about flying and I know how now.

GHS: fun; want to fly more; course bad; love it; interesting; good but lot of work; thought dangerous, but not now; for the birds.

Summary: Twenty-three students found Aviology fun and exciting. Thirty-three indicated they liked flying, learned a lot and thought Aviology important. Five wanted aviation careers. Five indicated they didn't like the course or flying.

ii) List as many ways as you can think of to improve the Aviology course.

The response for this question will be in total summary form.

1. more flying
2. more field trips
3. more films
4. more simulator
5. textbooks and reading material
6. build a plane
7. none
8. more or better equipment
9. more time on Aviology (Bunnell)

Comments:
It would be better if we had more experience flying. We learn how to fly and all about rules and regulations. But I feel after someone got us in the air they might change their mind.

iii) What do you feel was the most important thing you learned in Aviology: (Jot down the first thing that comes to your mind.)

NHS: how to use computer; flying a plane; navigate; instruments; parts of airplane and how it works.

BHS: instruments and controls; how to fly; use of simulator

PKY: what it takes to learn to fly; flying can be as easy as driving; basis of flying; meteorology; Physics involved with flight; how to fly safely; Jacksonville Center.

Comments:
Having the experience of flying an airplane by myself.

GHS: how to fly; why a plane flys; weather; effect of flying on mind and body feelings; will not sign up again for course.

Comments:
How a plane is able to stay in the air.

Summary: Fifteen students indicated how to fly most impo ant, nine indicated use of computer, seven indicated ıy a plane flys, six indicated instruments and simulator, seven indicated safety and how a plane works.

iv) List as many ways as you can think of indicating how Aviology was useful to you.

NHS: want to fly; more about science; how to fly; to use the simulator; how a plane flys; weather; understand flying better; plot course.

Comments:
In years to come, flying maybe (sic) the main sort of transportation.
I learned how to fly the simulator (sic) that we have.
I learned to read different things.
It's hard to be a pilot.

BHS: foundations for learning to fly; how an airplane works; career.

Comments:
I have a basic understanding of how to fly a plane and I've found out I would like to study Aviology in depth.

PKY: career; navigation; a little Physics; made me work and think more than most classes; how aviation fits into society; what it takes to learn how to fly.

Comments:
That I don't know.
Can predict the weather - sort of.
To explain to others about aerodynamics and a knowledge of the usefulness of the entire course for the society.

GHS: to fly; more science; how airplanes fly; how to make decisions; weather; interest in flying; credit.

Comments:
It sparked my interest in flying.

Summary: Aviology made ten students want to fly, eleven learned how to fly an airplane, eight learned about weather, seven learned to navigate, five indicated career, two indicated using the simulator was useful.

3. Conclusions:

Results from the evaluations of the Aviology project give some interesting insights into the program and the teachers teaching the program. Overall, the results of the attitude evaluation indicate a positive trend in attitude toward the program. The Private Pilot Written Exam results are mixed in meaning. This most likely is a result of the difference of teaching styles and stress in the course. The results on the Sanderson and the FAA Exams indicate students can obtain the knowledge needed to do well on these exams from the Aviology Course. The Sanderson Exam was judged by both teachers and students to be much more difficult than the FAA Exam.

The evaluation of the Student Questionnaire is probably the most important of the evaluations. It indicates the students' feelings about specific objectives of the course and the diverse differences in the teaching styles of the teachers.

Part one of the Student Questionnaire indicates that the majority of students found Aviology worthwhile with respect to excitement, fun, knowledge and understanding of science and society. But the use of the simulator as a motivator was not indicated as a prime motivator on the Questionnaire. Discussion with teachers and observations in the classroom with the simulator contradict the results of that question on the Questionnaire. It is our guess that the question is not worded correctly to elicit the true feeling of the student toward the simulator.

Part two of the Student Questionnaire indicates much of what was taught in the classroom, formative feedback from the students and the teaching styles of the teachers. Learning the mechanics of flying seemed most important to the students. Flying is fun, exciting and important ranked high in student comment. More flying, field trips, films and simulator time were listed as major needs in the program. How to fly, use of computers and charts and use of the simulator were listed as important learning experiences. Aviology made students want to fly airplanes, learn about weather, consider aviation as a career, and learn how to use the simulator.

An overview of all the data indicates that Aviology was successful as a science course using aviation as a motivator. The cost of the program was minimum and all schools participating in the program indicate no problem in supporting the program for next year. In every case, enrollment in the Aviology Course has increased, sometimes much more than expected. In Newberry High School, enrollment has increased from 27 students this year to 60 for next year - two classes. In Raines High School, enrollment has increased from 13 students to approximately 45 student - also two classes. In P. K. Yonge Laboratory School, enrollment has increased from 17 students to 43 students - also two classes. In Bunnell High School the situation is different. Last year Aviology was not able to be offered as such in the school because of scheduling difficulties.

The Aviology materials were used as a supplement in a Physics Course. The students accepted this enthusiastically and the program met with considerable success. For next year, the county and school have decided to offer a course in Aviology at Bunnell High School and pre-registration indicates a full class.

Data we received from the project teachers and results from the questionnaires gives evidence that the Aviology students have become aware of the different modes of transportation and of the necessity of air transportation as the most efficient modern rapid transit system for now and the future. The use of aviation as a transportation medium was indicated by a number of students as their preference even to the extent of becoming pilots.

Results from the sample of the State High School Student Survey indicate that about 50% of the students polled have flown on commercial aircraft. This is a high percentage of use, especially by high school students, for a form of transportation that is still considered to be a luxury by many. If this is an indication of what the students do, how much more use of air transportation would there be for the parents? From this data it can only be a speculation but it does indicate a real need for an understanding of the hows and the whys of aviation. Tomorrow these students will be the parents and if aviation is going to become the major means of mass transit in the future, then education in aviation is a must in order for aviation to continue to be successful and to be safe.

We are hoping to expand the study of the effectiveness of the Aviology Program during the next school year. Many items have not been completely investigated and many questions still need to be answered with regards to this year's study.

The use of the simulator, motivating activities, handout material and the teacher resource book still need work. These problems and many others will hopefully be solved by close cooperation with the teachers and students during next year's study.

APPENDIX I

ATTITUDE TEST
POST

There are no right or wrong answers to these questions. People differ in their opinions on them. Just indicate your own opinion by blacking in with a #2 pencil the number on the answer sheet which corresponds most closely with your feelings. Leave no blanks. Please place answers on provided answer sheets. 1 - Agree, 2 - Disagree

1. I am crazy about this subject.
2. The very existence of humanity depends upon this subject.
3. If I had my way, I would compel everybody to study this subject.
4. This subject is one of the most useful subjects I know.
5. I believe this subject is the basic one for all high school courses.
6. This is one subject that all young Americans should know.
7. This subject fascinates me.
8. The merits of this subject far outweigh the defects.
9. This subject gives pupils the ability to interpret situations they will meet in life.
10. This subject will help pupils socially as well as intellectually.
11. This subject makes me efficient in school work.
12. There are more chances for development of high ideals in this subject
13. This subject is interesting.
14. This subject teaches metholical reasoning.
15. This subject serves the needs of a large number of boys and girls.
16. All methods used in this subject have been thoroughly tested in the classroom by experienced teachers.
17. This subject has its merits and fills its purpose quite well.
18. Every year more students are taking this subject.
19. This subject aims mainly at power of execution or application.
20. This subject is not based on untried theories.
21. I think this subject is amusing.
22. This subject has its drawbacks, but I like it.
23. This subject might be worthwhile if it were taught right.
24. This subject doesn't worry me in the least.
25. My likes and dislikes for this subject balance one another.
26. This subject is all right, but I would not take anymore of it.
27. No student should be concerned with the way this subject is taught.
28. To me this subject is more or less boring.
29. No definite results are evident in this subject.
30. This subject does not motivate the pupil to do better work.
31. This subject has numerous limitations and defects.
32. This subject interferes with developing.
33. This subject is dull.
34. This subject seems to be a necessary evil.
35. This subject does not hold my interest at all.
36. The average student gets nothing worth having out of this subject.
37. All of the material in this subject is very uninteresting.
38. This subject can't benefit me.

39. This subject has no place in the modern world.
40. Nobody likes this subject.
41. This subject is more like a plague than a study.
42. This subject is all bunk.
3. No sane person would take this subject.
4. Words can't express my antagonism toward this subject.
). This is the worst subject taught in school.

APPENDIX II

by

P. A. Becht & T. Gadsden, Jr.

Part I

Choose and circle one number that best matches your feeling about the following questions. Also write the number in the blank at the left.

1 strongly agree
2 agree
3 so-so
4 disagree
5 strongly disagree

Add any comments that you would like beside each question.

___1. Aviology is really exciting.
1 2 3 4 5

___2. Aviology is fun.
1 2 3 4 5

___3. I learned a lot of science in Aviology.
1 2 3 4 5

___4. I learned how aviation could affect my life.
1 2 3 4 5

___5. Now I can explain to my best friend why an airplane flys.
1 2 3 4 5

___6. The simulator turned me on!
1 2 3 4 5

___7. Now I know what it takes to pilot and navigate an airplane.
1 2 3 4 5

Part II

Please answer the following questions:

1. Now that you have taken aviology, what do you think about flying?

2. List as many ways as you can think of to improve the aviology course.

3. What do you feel was the most important thing you learned in aviology? (Jot down the first thing that comes to your mind.)

4. List as many ways as you can think of indicating how aviology was useful to you.

APPENDIX III

AVIOLOGY SURVEY QUESTIONNAIRE

Please answer the questions below listed "to the Teacher." Then, will you please read the questions "To the Students" out loud to your class and tally the number of yes responses and the number of no responses in the spaces provided next to the questions.

SCHOOL_____

TEACHER_____

GRADE LEVEL_____

COURSE TITLE_____

NUMBER OF STUDENTS IN CLASS_____

To the Teacher:

Is there an aviation curriculum in your school? ___Yes ___No
If there is an aviation curriculum how many students are enrolled? ___

Please read the short aviology information sheet to your students, then ask the questions to the students.

To the Students:

1. Would you like to take a course like Aviology if it were offered in your school? ___Yes ___No

2. Have you ever flown in a commercial airplane? ___Yes ___No
in a private airplane? ___Yes ___No

3. When you graduate from high school, how many years of science will you have taken? ___1 year, ___ 2 years, ___3 years, ___4 years

4. Have you seriously considered an aviation career such as pilot, stewardess, airplane mechanic, business manager, ticket salesman, etc.?
___Yes ___No

APPENDAE

Course Description

Aviology is a one year physics course taught using concepts applied to aviation. The course gives students the opportuntiy to experience aviation along with learning the physics of aeronautics and the atmosphere. Students enrolled in the course will be able to fly, with an instructor, a light aircraft, understand the physics and mechanics of an engine, become a weatherman and fly an electronic aircraft simulator in the classroom. The physiology of aviation will be covered along with the effect of aviation on the community as well as the environment. The student will become aware that there is more to aviation than being a pilot and a stewardess and become acquainted with career opportunities within the field of aviation. The course is designed to be offered as a science credit.

Summary of Results

Any School Subject Attitude Test

Students in all four of the schools giving the attitude questionnaire showed positive attitudes toward the Aviology Course. The average scroe also was positive. An analysis of individual student attitudes showed 52 with positive, 11 with negative and 3 neutral. The graphical representation of these data also show that over half of the negative responses were within three points of the neutral score, 67. See Figure 1.

FAA Private Pilot Written Exam

The results of this exam are difficult to assess. Two schools did not give the exam, one school gave only the Sanderson exam, one school encouraged students to only take the FAA Private Pilot Written Exam and did not offer the Sanderson exam. One school took both exams. Of 25 students who took the Sanderson exam, scores ranged from 30 to 50, out of 100.

32 students took the FAA exam. In one school, none passed. In the other school, of those receiving their scores before the end of school, over half passed.

Aviology Student Questionnaire

Part one of the Student Questionnaire (the Q-sort) indicates a strong positive response to all of the statements with the exception of number vi, "The Simulator turned me on!" These data are illustrated in graphical form. See Figure 2. The results strongly indicate success of the program

from the viewpoint of the student in terms of excitement, fun, degree of learning about science and aviation, and degree of understanding about the role of aviation in the student's life.

Part two of the Student Questionnaire (free response) supports part one, with the exception that the responses concerning the simulator tend to contradict the neutral part one response. In part two, many positive attitudes toward the simulator were indicated. The listing below is an attempt to group the responses into a more readily understood form.

i) Now that you have taken Aviology, what do you think about flying?

Of 85 student responses:

50 students said that they were highly positive toward flying (fun, great, interesting, etc.).

21 students noted the importance of aviation or indicated a desire to go further in aviation.

6 students indicated negative attitudes of fear of flying.

8 students were only slightly positive.

ii) List as many ways as you can think of to improve the Aviology Course

Of 87 student responses:

45 suggested more of the activities that were already a part of the course.

12 indicated a need for things we do not have available.

14 made suggestions critical of the program as taught, indicating ways that improvements might be made.

8 said that no improvements were needed.

iii) What do you feel was the most important thing you learned in Aviology?

Of 56 student responses:

24 indicated that learning how and experiencing flying we e most important to them.

16 said that the knowledge of how and why a plane works was most important to them.

25 responded that various skills related to flying were of the greatest importance.

iv) List as many ways as you can think of indicating how Aviology was useful to you.

Of 87 student responses:

30 students said learning to fly or what it takes to fly.

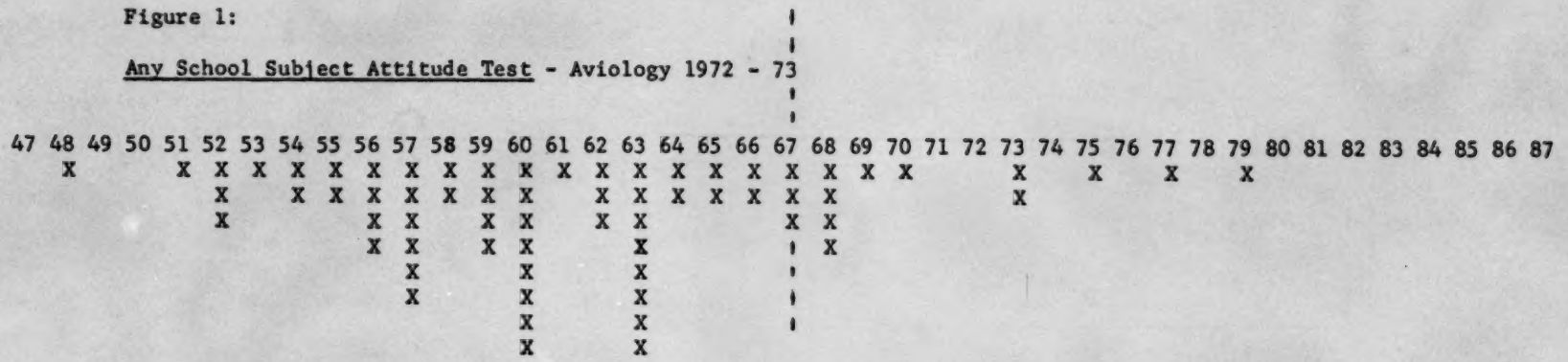
13 said it was useful in learning skills directly related to flying.

15 responded that they were now interested in aviation as a career or a vocation, or in its importance to society.

18 students found the opportunity to learn skills and information less directly related to flying through the Aviology Program. Areas mentioned included science, geometry, reading, listening, decision-making, and thinking.

6 students indicated that they found nothing of use to them in the program.

Figure 1:



67 is taken as the neutral score.

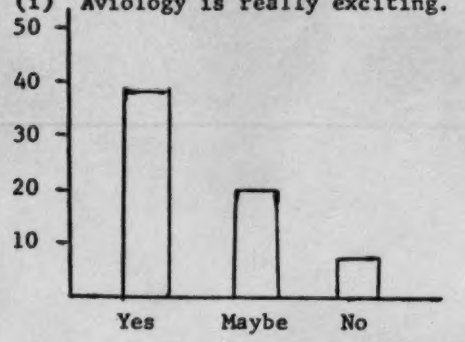
Scores less than 67 indicate positive attitudes.

Scores more than 67 indicate negative attitudes.

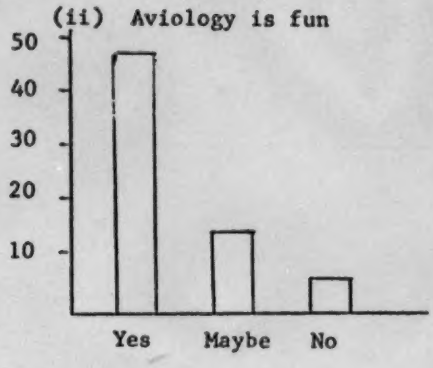
Figure 2:

Aviology Student Questionnaire - Aviology 1972-73

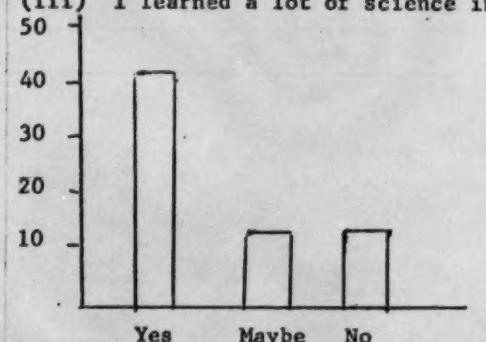
(i) Aviology is really exciting.



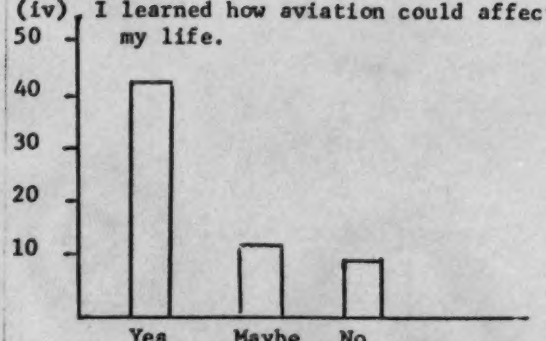
(ii) Aviology is fun



(iii) I learned a lot of science in Aviology



(iv) I learned how aviation could affect my life.



(v) Now I can explain to my best friend why an airplane flys.

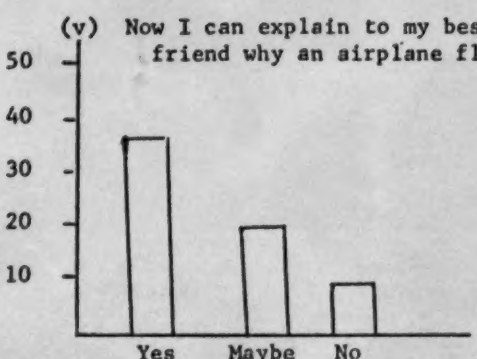
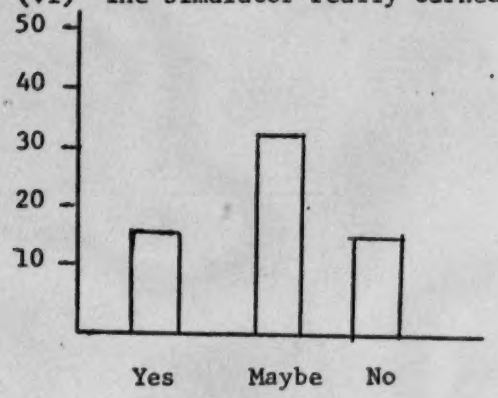


Figure 2: (cont)

(vi) The simulator really turned me on!



(vii) Now I know what it takes to pilot and navigate an airplane.